



Selected Acquisition Report (SAR)

RCS: DD-A&T(Q&A)823-438



Space Fence Ground-Based Radar System Increment 1 (Space Fence Inc 1)

As of FY 2017 President's Budget

Defense Acquisition Management
Information Retrieval
(DAMIR)

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Common Acronyms and Abbreviations for MDAP Programs

Acq O&M - Acquisition-Related Operations and Maintenance
ACAT - Acquisition Category
ADM - Acquisition Decision Memorandum
APB - Acquisition Program Baseline
APPN - Appropriation
APUC - Average Procurement Unit Cost
\$B - Billions of Dollars
BA - Budget Authority/Budget Activity
Blk - Block
BY - Base Year
CAPE - Cost Assessment and Program Evaluation
CARD - Cost Analysis Requirements Description
CDD - Capability Development Document
CLIN - Contract Line Item Number
CPD - Capability Production Document
CY - Calendar Year
DAB - Defense Acquisition Board
DAE - Defense Acquisition Executive
DAMIR - Defense Acquisition Management Information Retrieval
DoD - Department of Defense
DSN - Defense Switched Network
EMD - Engineering and Manufacturing Development
EVM - Earned Value Management
FOC - Full Operational Capability
FMS - Foreign Military Sales
FRP - Full Rate Production
FY - Fiscal Year
FYDP - Future Years Defense Program
ICE - Independent Cost Estimate
IOC - Initial Operational Capability
Inc - Increment
JROC - Joint Requirements Oversight Council
\$K - Thousands of Dollars
KPP - Key Performance Parameter
LRIP - Low Rate Initial Production
\$M - Millions of Dollars
MDA - Milestone Decision Authority
MDAP - Major Defense Acquisition Program
MILCON - Military Construction
N/A - Not Applicable
O&M - Operations and Maintenance
ORD - Operational Requirements Document
OSD - Office of the Secretary of Defense
O&S - Operating and Support
PAUC - Program Acquisition Unit Cost

PB - President's Budget
PE - Program Element
PEO - Program Executive Officer
PM - Program Manager
POE - Program Office Estimate
RDT&E - Research, Development, Test, and Evaluation
SAR - Selected Acquisition Report
SCP - Service Cost Position
TBD - To Be Determined
TY - Then Year
UCR - Unit Cost Reporting
U.S. - United States
USD(AT&L) - Under Secretary of Defense (Acquisition, Technology and Logistics)

Program Information

Program Name

Space Fence Ground-Based Radar System Increment 1 (Space Fence Inc 1)

DoD Component

Air Force

Responsible Office

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Date Assigned: April 3, 2013

References

SAR Baseline (Development Estimate)

Defense Acquisition Executive (DAE) Approved Acquisition Program Baseline (APB) dated June 18, 2014

Approved APB

Defense Acquisition Executive (DAE) Approved Acquisition Program Baseline (APB) dated June 18, 2014

Mission and Description

The Space Fence Ground-Based Radar System (Space Fence) replaces the mission of the Air Force Space Surveillance System (AFSSS) Very High Frequency (VHF) "fence" radar that performed detection of orbiting space objects before decommissioning in FY 2013. The Space Fence mission is to improve Space Situational Awareness by fielding a capability to detect and report small objects in Low Earth Orbit/Medium Earth Orbit (LEO/MEO). The system, comprising one operations center and two radar sites operating at S-band frequencies, will have a modern, net-centric architecture. Fielded capabilities will include uncued capability to find, fix and track small objects in LEO/MEO; improved completeness and accuracy of the space catalog; improved timeliness of orbital event information; and support for improved characterization of space objects.

The Space Fence Ground-Based Radar System Increment 1 (Space Fence Inc 1) includes the operations center, located at the Reagan Test Site Operations Center Huntsville, AL, and one radar site, located at Kwajalein Atoll, Republic of the Marshall Islands.

Executive Summary

The Space Fence Increment 1 program includes development of the first radar site located at Kwajalein Atoll, Republic of the Marshall Islands, and associated operations center functionality to be deployed at the Reagan Test Site Operations Center in Huntsville, Alabama.

After satisfying the required entrance criteria with the Design Walk-Through and 95% Facilities Design Technical Interchange Meeting (TIM) in February 2015, Lockheed Martin conducted multiple Critical Design Review (CDR) events that began in March 2015 and concluded with the 100% Facilities Design TIM in May 2015. Notification of successful CDR completion was issued June 8, 2015, within the APB threshold of October 2015.

The program received a funding cut of \$2.5M in FY 2016 as a result of the FY 2016 DoD Appropriations Act, December 2015.

Radar site construction broke ground on Kwajalein Atoll in February 2015. While completing radar site preparation and excavation, multiple differing site conditions were encountered to include underground utilities, contaminated soil, unusable laydown areas, and soil liquefaction. Addressing these conditions delayed planned efforts and resulted in Lockheed Martin requests for equitable adjustment (REAs) totaling \$15.4M thus far. The potential for additional REAs remains until all underground trenching work is completed in the second quarter of FY 2016. Construction efforts have proceeded, recovering a significant portion of the delays caused by differing site conditions. At this time all array foundations have been poured and vertical construction has commenced.

Construction of the Integration Test Bed (ITB), a larger radar prototype relative to the CDR prototype that incorporates end-item hardware and software, is nearing completion and will be operational by March 2016 to serve as a platform for risk mitigation and testing.

Production Readiness Reviews (PRRs) were conducted from June through December 2015 in conjunction with transmit and receive Line Replaceable Unit (LRU) manufacturing activities to support achievement of the ramp-up required for IOC system production. Proof of Design and Manufacturing LRU production was completed and an initial build of forty LRUs were installed in the CDR prototype. A build of 196 LRUs for installation in the Integration Test Bed was completed in January 2016.

The Space Fence and the Joint Space Operations Center Mission System programs signed an Interface Control Document in April 2015. The initial agreement established mutually agreed interface development requirements and planning parameters between the two systems so as to reduce uncertainty and risk. It continues to undergo refinement as part of efforts to ensure alignment of the two development programs for synchronization of testing and integration.

Software Build 2 was completed in September 2015 and Build 3 is in progress.

There are no significant software-related issues with this program at this time.

Threshold Breaches

APB Breaches		
Schedule		<input type="checkbox"/>
Performance		<input type="checkbox"/>
Cost	RDT&E	<input type="checkbox"/>
	Procurement	<input type="checkbox"/>
	MILCON	<input type="checkbox"/>
	Acq O&M	<input type="checkbox"/>
O&S Cost		<input type="checkbox"/>
Unit Cost	PAUC	<input type="checkbox"/>
	APUC	<input type="checkbox"/>

Nunn-McCurdy Breaches		
Current UCR Baseline		
	PAUC	None
	APUC	None
Original UCR Baseline		
	PAUC	None
	APUC	None

Schedule



Schedule Events				
Events	SAR Baseline Development Estimate	Current APB Development Objective/Threshold		Current Estimate
Milestone A	Mar 2009	Mar 2009	Mar 2009	Mar 2009
Technology Development - Phase A - SDR Contract Award	Jun 2009	Jun 2009	Jun 2009	Jun 2009
Technology Development - Phase A - PDR Contract Award	Jan 2011	Jan 2011	Jan 2011	Jan 2011
PDR	Feb 2012	Feb 2012	Feb 2012	Feb 2012
Milestone B - Increment 1	May 2014	May 2014	Nov 2014	May 2014
CDR	Apr 2015	Apr 2015	Oct 2015	Jun 2015
IOT&E Start	Oct 2018	Oct 2018	Apr 2019	Jun 2018
RAA	Jul 2019	Jul 2019	Jan 2020	Oct 2018

(Ch-1)

Change Explanations

(Ch-1) CDR current estimate changed from March 2015 to June 2015 to reflect the actual date of completion.

Notes

RAA is defined as the date when the PM has provided sufficient equipment and logistics resources to support IOC determination. The RAA objective date assumes the EMD contract award in June 2014, and consists of:

- DD250 of at least one radar sensor and SOC
- Ensuring communications links and connectivity to the Global Information Grid are in compliance with then-existing Net-Centric Enterprise Services standards, guidance and direction
- Initial spares for one radar sensor and SOC

- Common and peculiar support equipment
- Interim contractor support established
- Stand-alone training systems and resources at Initial Qualification Training and Upgrade Qualification Training locations

For this SAR, RAA is being used as a surrogate for IOC.

Acronyms and Abbreviations

CDR - Critical Design Review
IOT&E - Initial Operational Test & Evaluation
PDR - Preliminary Design Review
RAA - Required Assets Available
SDR - System Design Review
SOC - Space Fence Operations Center

Performance

Performance Characteristics				
SAR Baseline Development Estimate	Current APB Development Objective/Threshold		Demonstrated Performance	Current Estimate
System Training				
Using the ISD process, the Space Fence shall deliver a training system to applicable AFSPC and AETC units (TBD), that will enable units to possess and maintain a SORTS readiness Category Level rating of C-1 prior to operational acceptance. The training system shall include Contract Special Training (Type 1) that provides the requisite competencies training to test agency personnel, initial AFSPC cadre and AETC instructors to proficiency standards IAW AFI36-2201 (Ref 46). Before the start of Type 1 training, TOs must complete the contractor's TO certification process. Type 1 training shall be conducted prior to start of Operational Test & Evaluation, but no earlier than 12 months and not later than 6 months prior to operational acceptance of the weapon system. Type 1 training course(s) shall be tailored to meet the learning objectives of each duty position using the most cost-efficient training media, as determined by the AF ISD process. For CMR	Using the ISD process, the Space Fence shall deliver a training system to applicable AFSPC and AETC units (TBD), that will enable units to possess and maintain a SORTS readiness Category Level rating of C-1 prior to operational acceptance. The training system shall include Contract Special Training (Type 1) that provides the requisite competencies training to test agency personnel, initial AFSPC cadre and AETC instructors to proficiency standards IAW AFI36-2201 (Ref 46). Before the start of Type 1 training, TOs must complete the contractor's TO certification process. Type 1 training shall be conducted prior to start of Operational Test & Evaluation, but no earlier than 12 months and not later than 6 months prior to operational acceptance of the weapon system. Type 1 training course (s) shall be tailored to meet the learning objectives of each duty position using the most	(Threshold = Objective) Using the ISD process, the Space Fence shall deliver a training system to applicable AFSPC and AETC units (TBD), that will enable units to possess and maintain a SORTS readiness Category Level rating of C-1 prior to operational acceptance. The training system shall include Contract Special Training (Type 1) that provides the requisite competencies training to test agency personnel, initial AFSPC cadre and AETC instructors to proficiency standards IAW AFI36-2201 (Ref 46). Before the start of Type 1 training, TOs must complete the contractor's TO certification process. Type 1 training shall be conducted prior to start of Operational Test & Evaluation, but no earlier than 12 months and not later than 6 months prior to operational acceptance of the weapon system. Type 1 training course (s) shall be tailored to meet the learning objectives of each duty position using the most	TBD	Using the ISD process, the Space Fence shall deliver a training system to applicable AFSPC and AETC units (TBD), that will enable units to possess and maintain a SORTS readiness Category Level rating of C-1 prior to operational acceptance. The training system shall include Contract Special Training (Type 1) that provides the requisite competencies training to test agency personnel, initial AFSPC cadre and AETC instructors to proficiency standards IAW AFI36-2201 (Ref 46). Before the start of Type 1 training, TOs must complete the contractor's TO certification process. Type 1 training shall be conducted prior to start of Operational Test & Evaluation, but no earlier than 12 months and not later than 6 months prior to operational acceptance of the weapon system. Type 1 training course (s) shall be tailored to meet the learning objectives of each duty position using the most

operations training and evaluation: The Space Fence shall deliver off-line training simulation capability with fidelity that emulates typical operations, which shall: Be physically and electronically separated from the operational system. Have software application(s) which utilize and integrate with the government-furnished SST software. Look, sound and feel like the actual operational equipment to support required proficiency levels. Be capable of being upgraded as operational functionality is upgraded. The Space Fence shall deliver the associated COTS-based hardware to applicable AFSPC and AETC units (TBD), that will: Fulfill the hardware compatibility requirements of the SST software. Fulfill the security accreditation requirements of the training simulation software. The Space Fence shall collaborate with the SST software vendor to integrate the simulation software with the COTS-based hardware and the government-furnished SST software. The Space Fence shall provide operations procedures and Type 1 training on the use of the integrated SST-based simulation capability to AETC instructors and AFSPC cadre. The integrated SST-based training simulation

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capability shall be delivered no earlier than 12 months and not later than 6 months prior to operational acceptance. The integrated SST - based training simulation capability shall meet AFSPC SIMCERT requirements.	training on the use of the integrated SST - based simulation capability to AETC instructors and AFSPC cadre. The integrated SST-based training simulation capability shall be delivered no earlier than 12 months and not later than 6 months prior to operational acceptance. The integrated SST -based training simulation capability shall meet AFSPC SIMCERT requirements.	the integrated SST - based simulation capability to AETC instructors and AFSPC cadre. The integrated SST-based training simulation capability shall be delivered no earlier than 12 months and not later than 6 months prior to operational acceptance. The integrated SST -based training simulation capability shall meet AFSPC SIMCERT requirements.		training on the use of the integrated SST - based simulation capability to AETC instructors and AFSPC cadre. The integrated SST-based training simulation capability shall be delivered no earlier than 12 months and not later than 6 months prior to operational acceptance. The integrated SST -based training simulation capability shall meet AFSPC SIMCERT requirements.
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Net-Ready

Space Fence must fully support execution of all operational activities and information exchanges identified in the DoD Enterprise Architecture and solution architectures based on integrated DoDAF content, and must satisfy the technical requirements for transition to Net-Centric military operations to include: Solution architecture products compliant with DoD Enterprise Architecture based on integrated DoDAF content, including specified operationally effective information exchanges. Compliant with Net - Centric Data Strategy and Net-Centric Services Strategy, and the principles and rules identified in the DoD IEA, excepting tactical and non-IP communications. Compliant with GIG Technical Guidance	Space Fence must fully support execution of all operational activities and information exchanges identified in the DoD Enterprise Architecture and solution architectures based on integrated DoDAF content, and must satisfy the technical requirements for transition to Net-Centric military operations to include: Solution architecture products compliant with DoD Enterprise Architecture based on integrated DoDAF content, including specified operationally effective information exchanges. Compliant with Net -Centric Data Strategy and Net-Centric Services Strategy, and the principles and rules identified in the DoD IEA, excepting tactical and non-IP communi-	Space Fence must fully support execution of joint critical operational activities and information exchanges identified in the DoD Enterprise Architecture and solution architectures based on integrated DoDAF content, and must satisfy the technical requirements for transition to Net-Centric military operations to include: Solution architecture products compliant with DoD Enterprise Architecture based on integrated DoDAF content, including specified operationally effective information exchanges. Compliant with Net - Centric Data Strategy and Net-Centric Services Strategy, and the principles and rules identified in the DoD IEA, excepting tactical and non-IP communications. Compliant with	TBD	Space Fence must fully support execution of all operational activities and information exchanges identified in the DoD Enterprise Architecture and solution architectures based on integrated DoDAF content, and must satisfy the technical requirements for transition to Net-Centric military operations to include: Solution architecture products compliant with DoD Enterprise Architecture based on integrated DoDAF content, including specified operationally effective information exchanges. Compliant with Net -Centric Data Strategy and Net-Centric Services Strategy, and the principles and rules identified in the DoD IEA, excepting tactical and non-IP communi-
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to include IT Standards identified in the StdV-1 and implementation guidance of GESPs necessary to meet all operational requirements specified in the DoD Enterprise Architecture and solution architecture views. Information assurance requirements including availability, integrity, authentication, confidentiality, and non-repudiation, and issuance of an ATO by the DAA. Supportability requirements to include SAASM, Spectrum and JTRS requirements	cations. Compliant with GIG Technical Guidance to include IT Standards identified in the StdV-1 and implementation guidance of GESPs necessary to meet all operational requirements specified in the DoD Enterprise Architecture and solution architecture views. Information assurance requirements including availability, integrity, authentication, confidentiality, and non-repudiation, and issuance of an ATO by the DAA. Supportability requirements to include SAASM, Spectrum and JTRS requirements	GIG Technical Guidance to include IT Standards identified in the StdV-1 and implementation guidance of GESPs necessary to meet all operational requirements specified in the DoD Enterprise Architecture and solution architecture views. Information assurance requirements including availability, integrity, authentication, confidentiality, and non-repudiation, and issuance of an IATO or ATO by the DAA. Supportability requirements to include SAASM, Spectrum and JTRS requirements		cations. Compliant with GIG Technical Guidance to include IT Standards identified in the StdV-1 and implementation guidance of GESPs necessary to meet all operational requirements specified in the DoD Enterprise Architecture and solution architecture views. Information assurance requirements including availability, integrity, authentication, confidentiality, and non-repudiation, and issuance of an ATO by the DAA. Supportability requirements to include SAASM, Spectrum and JTRS requirements
MDT Size				
MDT = 10 cm (cubesat) at orbital altitudes \geq 250km and \leq 2,000 km. MDT = 20 cm (cubesat) at orbital altitudes \geq 2,000km and \leq 3,000 km	MDT = 10 cm (cubesat) at orbital altitudes \geq 250km and \leq 2,000 km. MDT = 20 cm (cubesat) at orbital altitudes \geq 2,000km and \leq 3,000 km	(Threshold = Objective) MDT = 10 cm (cubesat) at orbital altitudes \geq 250km and \leq 2,000 km. MDT = 20 cm (cubesat) at orbital altitudes \geq 2,000km and \leq 3,000 km	TBD	MDT = 10 cm (cubesat) at orbital altitudes \geq 250km and \leq 2,000 km. MDT = 20 cm (cubesat) at orbital altitudes \geq 2,000km and \leq 3,000 km
Fence Integrity				
\geq 95% (Cued); \geq 50% (Un-cued)	\geq 95% (Cued); \geq 50% (Un-cued)	(Threshold = Objective) \geq 95% (Cued); \geq 50% (Un-cued)	TBD	\geq 95% (Cued); \geq 50% (Un-cued)
Surveillance and Track Coverage				
IOC: 1) 250-800 km: determined by scan angle required 800-3,000 km; 2) 800-3,000 km: 2 tracks (Cued /Un-cued); FOC: 1) 250-550 km: determined by scan angle required for 550-3,000 km; 2) 550-800 km: 2 tracks (Cued /Un-cued) • 800-3,000 km: 2	IOC: 1) 250-800 km: determined by scan angle required 800-3,000 km; 2) 800-3,000 km: 2 tracks (Cued /Un-cued); FOC: 1) 250-550 km: determined by scan angle required for 550-3,000 km; 2) 550-800 km: 2 tracks (Cued /Un-cued) • 800-	(Threshold = Objective) IOC: 1) 250-800 km: determined by scan angle required 800-3,000 km; 2) 800-3,000 km: 2 tracks (Cued /Un-cued); FOC: 1) 250-550 km: determined by scan angle required for 550-3,000 km; 2) 550-800 km: 2 tracks	TBD	IOC: 1) 250-800 km: determined by scan angle required 800-3,000 km; 2) 800-3,000 km: 2 tracks (Cued /Un-cued); FOC: 1) 250-550 km: determined by scan angle required for 550-3,000 km; 2) 550-800 km: 2 tracks (Cued /Un-cued) • 800-

tracks (Un-cued); 4 tracks (Cued)	3,000 km: 2 tracks (Un-cued); 4 tracks (Cued)	(Cued /Un-cued) • 800-3,000 km: 2 tracks (Un-cued); 4 tracks (Cued)		3,000 km: 2 tracks (Un-cued); 4 tracks (Cued)
E3				
All components of the Space Fence shall operate in their intended operational electro-magnetic environment without suffering or causing unacceptable performance degradation due to EMI from other electronic equipment in the same environment. The Space Fence shall not cause negative impacts, mission degradation, or other interference with systems operating in the same shared electro-magnetic environment. Systems operating in the same shared electro-magnetic environment as the Space Fence shall not cause unacceptable impacts, mission degradation, or other interference with normal operations of the Space Fence.	All components of the Space Fence shall operate in their intended operational electro-magnetic environment without suffering or causing unacceptable performance degradation due to EMI from other electronic equipment in the same environment. The Space Fence shall not cause negative impacts, mission degradation, or other interference with systems operating in the same shared electro-magnetic environment. Systems operating in the same shared electro-magnetic environment as the Space Fence shall not cause unacceptable impacts, mission degradation, or other interference with normal operations of the Space Fence.	(Threshold = Objective) All components of the Space Fence shall operate in their intended operational electro-magnetic environment without suffering or causing unacceptable performance degradation due to EMI from other electronic equipment in the same environment. The Space Fence shall not cause negative impacts, mission degradation, or other interference with systems operating in the same shared electro-magnetic environment. Systems operating in the same shared electro-magnetic environment as the Space Fence shall not cause unacceptable impacts, mission degradation, or other interference with normal operations of the Space Fence.	TBD	All components of the Space Fence shall operate in their intended operational electro-magnetic environment without suffering or causing unacceptable performance degradation due to EMI from other electronic equipment in the same environment. The Space Fence shall not cause negative impacts, mission degradation, or other interference with systems operating in the same shared electro-magnetic environment. Systems operating in the same shared electro-magnetic environment as the Space Fence shall not cause unacceptable impacts, mission degradation, or other interference with normal operations of the Space Fence.
Sustainment Ao				
Space Fence System (excluding SOC) Ao >= 95% SOC Ao >= 98%	Space Fence System (excluding SOC) Ao >= 95% SOC Ao >= 98%	(Threshold = Objective) Space Fence System (excluding SOC) Ao >= 95% SOC Ao >= 98%	TBD	Space Fence System (excluding SOC) Ao >= 95% SOC Ao >= 98%

Requirements Reference

CDD dated June 11, 2012

Change Explanations

None

Acronyms and Abbreviations

AETC - Air Education and Training Command
AF - Air Force
AFI - Air Force Instruction
AFSPC - Air Force Space Command
Ao - Operational Availability
ATO - Authority To Operate
cm - centimeter
CMR - Combat Mission Ready
COTS - Commercial Off The Shelf
DAA - Designating Accrediting Authority
DoD IEA - DoD Information Enterprise Architecture
DoDAF - Department of Defense Architecture Framework
E3 - Electromagnetic Environmental Effects
EMI - Electromagnetic Interference
GESPs - GIG Enterprise Service Profiles
GIG - Global Information Grid
IAW - In Accordance With
IP - Internet Protocol
ISD - Instructional Systems Design/Development
IT - Information Technology
JTRS - Joint Tactical Radio System
km - Kilometer
MDT - Minimum Detectable Target
Ref - Reference
SAASM - Selective Availability Anti-spoofing Module
SIMCERT - Simulator Certification
SOC - Space Operations Center
SORTS - Status of Resources and Training System
SST - Standard Space Trainer
StdV - Standards View
TO - Technical Order

Track to Budget

RDT&E			
Appn	BA	PE	
Air Force	3600	05	0604425F
	Project	Name	
	65A009	Space Fence (Shared) (Sunk)	
Air Force	3600	05	0604426F
	Project	Name	
	65A009	Space Fence	

Notes

Prior to FY 2015 all funds were executed and reported in PE 0604225F (Space Situational Awareness Systems).

Cost and Funding

Cost Summary

Total Acquisition Cost							
Appropriation	BY 2014 \$M			BY 2014 \$M	TY \$M		
	SAR Baseline Development Estimate	Current APB Development Objective/Threshold		Current Estimate	SAR Baseline Development Estimate	Current APB Development Objective	Current Estimate
RDT&E	1567.7	1567.7	1724.5	1491.3	1594.2	1594.2	1502.9
Procurement	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Flyaway	--	--	--	0.0	--	--	0.0
Recurring	--	--	--	0.0	--	--	0.0
Non Recurring	--	--	--	0.0	--	--	0.0
Support	--	--	--	0.0	--	--	0.0
Other Support	--	--	--	0.0	--	--	0.0
Initial Spares	--	--	--	0.0	--	--	0.0
MILCON	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Acq O&M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	1567.7	1567.7	N/A	1491.3	1594.2	1594.2	1502.9

Current APB Cost Estimate Reference

CAPE ICE dated May 23, 2014

Confidence Level

Confidence Level of cost estimate for current APB: 50%

The ICE to support the Space Fence Increment 1 program, like all life-cycle cost estimates previously performed by the Office of CAPE, is built upon a product-oriented work breakdown structure, based on historical actual cost information to the maximum extent possible, and, most importantly, based on conservative assumptions that are consistent with actual demonstrated contractor and Government performance for a series of acquisition programs in which the Department has been successful.

It is difficult to calculate mathematically the precise confidence levels associated with life-cycle cost estimates prepared for MDAPs. Based on the rigor in methods used in building estimates, the strong adherence to the collection and use of historical cost information, and the review of applied assumptions, we project that it is about equally likely that the estimate will prove too low or too high for execution of the program described.

Total Quantity			
Quantity	SAR Baseline Development Estimate	Current APB Development	Current Estimate
RDT&E	1	1	1
Procurement	0	0	0
Total	1	1	1

Cost and Funding

Funding Summary

Appropriation Summary									
FY 2017 President's Budget / December 2015 SAR (TY\$ M)									
Appropriation	Prior	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	To Complete	Total
RDT&E	1038.3	240.7	168.4	50.2	5.3	0.0	0.0	0.0	1502.9
Procurement	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MILCON	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Acq O&M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PB 2017 Total	1038.3	240.7	168.4	50.2	5.3	0.0	0.0	0.0	1502.9
PB 2016 Total	1046.8	243.9	196.0	68.5	5.3	0.0	0.0	0.0	1560.5
Delta	-8.5	-3.2	-27.6	-18.3	0.0	0.0	0.0	0.0	-57.6

Quantity Summary										
FY 2017 President's Budget / December 2015 SAR (TY\$ M)										
Quantity	Undistributed	Prior	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	To Complete	Total
Development	1	0	0	0	0	0	0	0	0	1
Production	0	0	0	0	0	0	0	0	0	0
PB 2017 Total	1	0	0	0	0	0	0	0	0	1
PB 2016 Total	1	0	0	0	0	0	0	0	0	1
Delta	0	0	0	0	0	0	0	0	0	0

Cost and Funding

Annual Funding By Appropriation

Annual Funding							
3600 RDT&E Research, Development, Test, and Evaluation, Air Force							
Fiscal Year	Quantity	TY \$M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
2005	--	--	--	--	--	--	5.2
2006	--	--	--	--	--	--	6.6
2007	--	--	--	--	--	--	--
2008	--	--	--	--	--	--	13.8
2009	--	--	--	--	--	--	25.5
2010	--	--	--	--	--	--	62.8
2011	--	--	--	--	--	--	138.4
2012	--	--	--	--	--	--	111.4
2013	--	--	--	--	--	--	203.6
2014	--	--	--	--	--	--	279.3
2015	--	--	--	--	--	--	191.7
2016	--	--	--	--	--	--	240.7
2017	--	--	--	--	--	--	168.4
2018	--	--	--	--	--	--	50.2
2019	--	--	--	--	--	--	5.3
Subtotal	1	--	--	--	--	--	1502.9

Annual Funding							
3600 RDT&E Research, Development, Test, and Evaluation, Air Force							
Fiscal Year	Quantity	BY 2014 \$M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
2005	--	--	--	--	--	--	6.1
2006	--	--	--	--	--	--	7.5
2007	--	--	--	--	--	--	--
2008	--	--	--	--	--	--	15.0
2009	--	--	--	--	--	--	27.3
2010	--	--	--	--	--	--	66.4
2011	--	--	--	--	--	--	143.6
2012	--	--	--	--	--	--	113.6
2013	--	--	--	--	--	--	204.2
2014	--	--	--	--	--	--	276.4
2015	--	--	--	--	--	--	187.8
2016	--	--	--	--	--	--	232.3
2017	--	--	--	--	--	--	159.6
2018	--	--	--	--	--	--	46.7
2019	--	--	--	--	--	--	4.8
Subtotal	1	--	--	--	--	--	1491.3

Low Rate Initial Production

There is no LRIP for this program.

Foreign Military Sales

None

Nuclear Costs

None

Unit Cost

Unit Cost Report

Item	BY 2014 \$M	BY 2014 \$M	% Change
	Current UCR Baseline (Jun 2014 APB)	Current Estimate (Dec 2015 SAR)	

Program Acquisition Unit Cost

Cost	1567.7	1491.3	
Quantity	1	1	
Unit Cost	1567.700	1491.300	-4.87

Average Procurement Unit Cost

Cost	0.0	0.0	
Quantity	0	0	
Unit Cost	--	--	--

Item	BY 2014 \$M	BY 2014 \$M	% Change
	Original UCR Baseline (Jun 2014 APB)	Current Estimate (Dec 2015 SAR)	

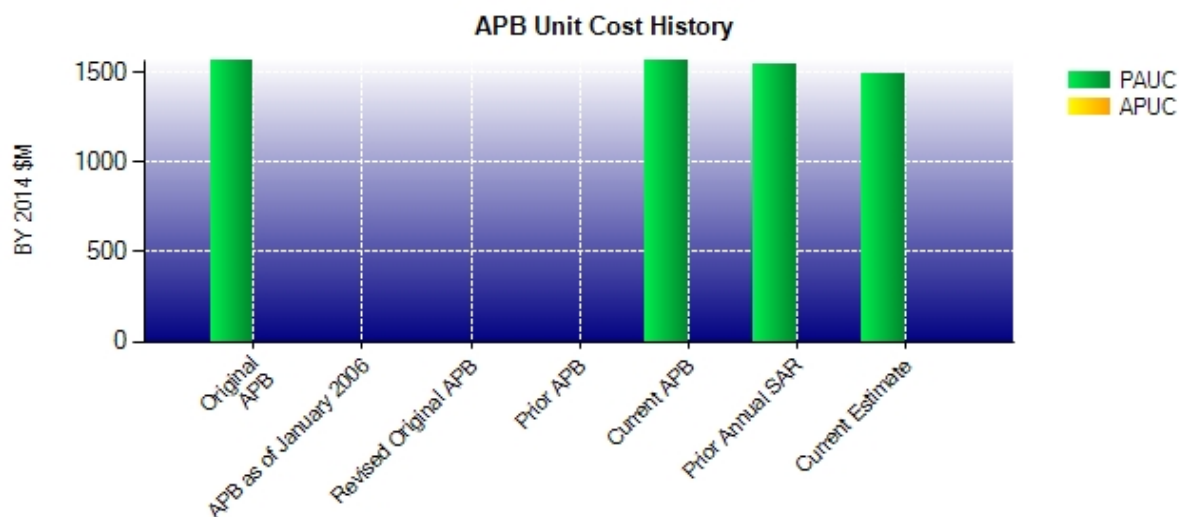
Program Acquisition Unit Cost

Cost	1567.7	1491.3	
Quantity	1	1	
Unit Cost	1567.700	1491.300	-4.87

Average Procurement Unit Cost

Cost	0.0	0.0	
Quantity	0	0	
Unit Cost	--	--	--

Unit Cost History



Item	Date	BY 2014 \$M		TY \$M	
		PAUC	APUC	PAUC	APUC
Original APB	Jun 2014	1567.700	N/A	1594.200	N/A
APB as of January 2006	N/A	N/A	N/A	N/A	N/A
Revised Original APB	N/A	N/A	N/A	N/A	N/A
Prior APB	N/A	N/A	N/A	N/A	N/A
Current APB	Jun 2014	1567.700	N/A	1594.200	N/A
Prior Annual SAR	Dec 2014	1541.300	N/A	1560.500	N/A
Current Estimate	Dec 2015	1491.300	N/A	1502.900	N/A

SAR Unit Cost History

Current SAR Baseline to Current Estimate (TY \$M)									
Initial PAUC Development Estimate	Changes								PAUC Current Estimate
	Econ	Qty	Sch	Eng	Est	Oth	Spt	Total	
1594.200	-12.700	0.000	0.000	0.000	-78.600	0.000	0.000	-91.300	1502.900

Current SAR Baseline to Current Estimate (TY \$M)									
Initial APUC Development Estimate	Changes								APUC Current Estimate
	Econ	Qty	Sch	Eng	Est	Oth	Spt	Total	
0.000	--	--	--	--	--	--	--	--	0.000

An APUC Unit Cost History is not available, since no Initial APUC Estimate had been calculated due to a lack of defined quantities.

SAR Baseline History					
Item	SAR Planning Estimate	SAR Development Estimate	SAR Production Estimate	Current Estimate	
Milestone A	N/A	Jun 2009	N/A	Jun 2009	
Milestone B	N/A	May 2014	N/A	May 2014	
Milestone C	N/A	N/A	N/A	N/A	
IOC	N/A	Jul 2019	N/A	Oct 2018	
Total Cost (TY \$M)	N/A	1594.2	N/A	1502.9	
Total Quantity	N/A	1	N/A	1	
PAUC	N/A	1594.200	N/A	1502.900	

Cost Variance

Summary TY \$M				
Item	RDT&E	Procurement	MILCON	Total
SAR Baseline (Development Estimate)	1594.2	--	--	1594.2
Previous Changes				
Economic	-7.9	--	--	-7.9
Quantity	--	--	--	--
Schedule	--	--	--	--
Engineering	--	--	--	--
Estimating	-25.8	--	--	-25.8
Other	--	--	--	--
Support	--	--	--	--
Subtotal	-33.7	--	--	-33.7
Current Changes				
Economic	-4.8	--	--	-4.8
Quantity	--	--	--	--
Schedule	--	--	--	--
Engineering	--	--	--	--
Estimating	-52.8	--	--	-52.8
Other	--	--	--	--
Support	--	--	--	--
Subtotal	-57.6	--	--	-57.6
Total Changes	-91.3	--	--	-91.3
CE - Cost Variance	1502.9	--	--	1502.9
CE - Cost & Funding	1502.9	--	--	1502.9

Summary BY 2014 \$M				
Item	RDT&E	Procurement	MILCON	Total
SAR Baseline (Development Estimate)	1567.7	--	--	1567.7
Previous Changes				
Economic	--	--	--	--
Quantity	--	--	--	--
Schedule	--	--	--	--
Engineering	--	--	--	--
Estimating	-26.4	--	--	-26.4
Other	--	--	--	--
Support	--	--	--	--
Subtotal	-26.4	--	--	-26.4
Current Changes				
Economic	--	--	--	--
Quantity	--	--	--	--
Schedule	--	--	--	--
Engineering	--	--	--	--
Estimating	-50.0	--	--	-50.0
Other	--	--	--	--
Support	--	--	--	--
Subtotal	-50.0	--	--	-50.0
Total Changes	-76.4	--	--	-76.4
CE - Cost Variance	1491.3	--	--	1491.3
CE - Cost & Funding	1491.3	--	--	1491.3

Previous Estimate: December 2014

RDT&E		\$M	
Current Change Explanations		Base Year	Then Year
Revised escalation indices. (Economic)		N/A	-4.8
Adjustment for current and prior escalation. (Estimating)		+2.8	+2.9
Revised estimate to realign with CAPE ICE. (Estimating)		-41.2	-43.8
Congressional Reductions in FY 2016. (Estimating)		-2.4	-2.5
Revised estimate to reflect Federally Funded Research and Development Centers reduction in FY 2016. (Estimating)		-0.7	-0.7
Revised estimate to reflect Small Business Innovative Research adjustment in FY 2015. (Estimating)		-8.2	-8.4
Revised estimate due to inflation rate adjustments for non-pay/non-fuel. (Estimating)		-2.1	-2.2
Revised estimate to reflect application of new outyear inflation indices. (Estimating)		+1.8	+1.9
RDT&E Subtotal		-50.0	-57.6

Contracts

Contract Identification

Appropriation: RDT&E
Contract Name: Space Fence
Contractor: Lockheed Martin Corp.
Contractor Location: 199 Borton Landing Rd
 Moorestown, NJ 08057
Contract Number: FA8709-14-C-0001
Contract Type: Fixed Price Incentive(Firm Target) (FPIF), Cost Plus Fixed Fee (CPFF), Cost (CR)
Award Date: June 02, 2014
Definitization Date: June 02, 2014

Contract Price							
Initial Contract Price (\$M)			Current Contract Price (\$M)			Estimated Price At Completion (\$M)	
Target	Ceiling	Qty	Target	Ceiling	Qty	Contractor	Program Manager
914.7	977.8	1	915.3	979.0	1	915.3	915.3

Target Price Change Explanation

The difference between the Initial Contract Price Target and the Current Contract Price Target is due to an erroneous initial price input by the program office in the previous SAR, which should have been 914.7. Additionally, an option CLIN 0026 was awarded on January 20, 2015 increasing the target price by 0.6.

Contract Variance		
Item	Cost Variance	Schedule Variance
Cumulative Variances To Date (12/27/2015)	-10.9	-20.6
Previous Cumulative Variances	+3.7	-11.0
Net Change	-14.6	-9.6

Cost and Schedule Variance Explanations

The unfavorable net change in the cost variance is due to construction cost growth due to Differing Site Conditions.

The unfavorable net change in the schedule variance is due to construction schedule slips due to Differing Site Conditions.

Notes

Contract performance data is based solely on CLIN 0001 data from the contract.

Deliveries and Expenditures

Deliveries				
Delivered to Date	Planned to Date	Actual to Date	Total Quantity	Percent Delivered
Development	0	0	1	0.00%
Production	0	0	0	--
Total Program Quantity Delivered	0	0	1	0.00%

Expended and Appropriated (TY \$M)			
Total Acquisition Cost	1502.9	Years Appropriated	12
Expended to Date	744.4	Percent Years Appropriated	80.00%
Percent Expended	49.53%	Appropriated to Date	1279.0
Total Funding Years	15	Percent Appropriated	85.10%

The above data is current as of February 29, 2016.

Operating and Support Cost

Cost Estimate Details

Date of Estimate:	May 01, 2014
Source of Estimate:	CAPE ICE
Quantity to Sustain:	1
Unit of Measure:	System
Service Life per Unit:	20.00 Years
Fiscal Years in Service:	FY 2019 - FY 2039

Space Fence Inc 1 consists of one quantity that includes the control center and one radar site.

Sustainment Strategy

The Space Fence System will employ a two level maintenance and support concept (organizational and depot) similar to the current Space Surveillance Network (SSN) sensors. The development contractor will provide Interim Contractor Support (ICS), for both organizational and depot, for Increment 1 of the Space Fence system for up to two years after IOC for Kwajalein Atoll, Marshall Islands. During the ICS period, the contractor will perform both organizational and depot level maintenance on the Space Fence weapon system.

The Space Fence Depot Source of Report (DSOR) is complete and has indicated all Space Fence depot repairable workload (hardware and software) as well as cryptological equipment is considered core workload. Oklahoma City Air Logistics Center (OC-ALC) is designated as the depot for hardware and software and the Cryptologic Systems Group in San Antonio, TX is designated as the depot for cryptological equipment.

Planning activity for the depot maintenance with OC-ALC is underway to identify depot requirements and ensure proper activation of the sustainment capability at OC-ALC. As the activities progress, the information gained from the process, as well as the business case analysis, will influence sustainment support strategy after full operational capability. This will ensure the best mix of public and/or private capabilities will be used to sustain the system while meeting statutory requirements. Three essential areas are being addressed: (1) item management of parts (supply source), (2) depot repair, i.e., software/hardware maintenance, and (3) depot management type activities.

System logistics support for the Space Fence Inc 1 program will be performed over the life of the system, expected to be 20 years. This support includes maintenance and periodic technology refreshes to assure the system continues to meet required performance, and allows upgrades when mission requirements dictate as well as the government management of these processes.

The full product support package, including technical orders, support equipment, training, and initial spares, will be delivered by the development contractor prior to fielding, which will enable full sustainment of the system.

Antecedent Information

The Antecedent system is Air Force Space Surveillance System (AFSSS). AFSSS estimates are based on one unit with a service life of 15 years (FY 1998 to FY 2013). The AFSSS was closed October 1, 2013. Cost details were provided by the Air Force Total Ownership Cost database.

Annual O&S Costs BY2014 \$M		
Cost Element	Space Fence Inc 1 Average Annual Cost Per System	Air Force Space Surveillance System (AFSSS) (Antecedent) Average Annual Cost Per System
Unit-Level Manpower	5.221	0.705
Unit Operations	16.990	5.050
Maintenance	2.422	1.240
Sustaining Support	11.262	1.432
Continuing System Improvements	14.224	0.610
Indirect Support	9.828	1.595
Other	0.274	0.000
Total	60.221	10.632

Other costs include Depot Standup amortized over the 20 year design life.

Item	Total O&S Cost \$M		
	Space Fence Inc 1		Air Force Space Surveillance System (AFSSS) (Antecedent)
	Current Development APB Objective/Threshold	Current Estimate	
Base Year	1208.6	1329.5	1204.3
Then Year	1554.1	N/A	1554.1

Disposal Cost is included in the Operating and Support Cost of the current APB objective and threshold for this program.

Equation to Translate Annual Cost to Total Cost

Total O&S Costs = Unitized cost * number of systems * service life per system

Total O&S Costs = \$60.221M * 1 Space Fence Inc 1 system * 20 year design life = \$1204M

O&S Cost Variance		
Category	BY 2014 \$M	Change Explanations
Prior SAR Total O&S Estimates - Dec 2014 SAR	1204.3	
Programmatic/Planning Factors	0.0	
Cost Estimating Methodology	0.0	
Cost Data Update	0.0	
Labor Rate	0.0	
Energy Rate	0.0	
Technical Input	0.0	
Other	0.0	
Total Changes	0.0	
Current Estimate	1204.3	

Disposal Estimate Details

Date of Estimate:	May 01, 2014
Source of Estimate:	CAPE ICE
Disposal/Demilitarization Total Cost (BY 2014 \$M):	Total costs for disposal of all System are 4.3